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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is a collection of brief abstracts on miscellaneous topics from the current Soviet technical literature. The intent is to supply a quick look at items of possible interest, including topics not necessarily named in the DARPA interest profile, as a supplement to our reportage on specified topics. It is intended to publish this collection on a monthly basis, to continue to provide prompt coverage of numerous aspects of Soviet R&D. As an added feature, all recently acquired books will be listed as they are received. A list of source abbreviations is appended.		

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INTRODUCTION

This is a collection of brief abstracts on miscellaneous topics from the current Soviet technical literature. The intent is to supply a quick look at items of possible interest, including topics not necessarily named in the DARPA interest profile, as a supplement to our reportage on specified topics.

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For further information the reader is invited to call Stuart Hibben or Lee Boylan at Informatics on (301)-770-3000.

Ceramic for MHD Generator (verbatim)

Test results are presented on characteristics of various refractory ceramics designed for use as insulators and electrodes in MHD channels. Insulating types include high alumina-content ceramic, magnesium and beryllium oxide ceramics, and periclase cement. For electrodes, zirconium dioxide stabilized with calcium oxide as well as cerium dioxide and yttrium oxide have been tested. Electrical conductivity of these materials at high temperatures is listed. Work along these lines in other countries is also reviewed. [Cwen, A. Highly refractory ceramic for MHD channels. Szko i ceram., #11, 1974, 337-340). (RZhKh 19M, 10/75, #10M85)].

Aluminum-Steel Composite (abstract)

A technique for producing sheet Al-steel composite has been developed at the Academy's Baykov Institute of Metallurgy. The method consists of depositing fine fused aluminum droplets onto a matrix band of steel filaments, forming a firm bond. Bands are then combined in rolling and pressing operations to form standard size sheet. The composite has an ultimate strength at least four times that of the best aluminum alloys, as well as an elasticity modulus triple that of aluminum.

A pilot production line has been set up in Kaluga which is producing the composite sheet in lengths up to 1-1/2 meters. Attempts are in progress to increase this size to normal production dimensions. The article notes that the manufacturing process is based on technology patented in the U. S. and Canada. [Pavlov, L. Composite metal. Pravda, 8 July 1975, p. 4].

New High-Temperature Superconducting Material (abstract)

A new Nb₃Si crystalline modification with 18.5-19 K superconducting transition has been obtained at the Institute of Metallic Physics, Ukrainian Academy of Sciences, by explosive compaction of Nb₃Si powder at estimated pressure of over 1 Mbar. Presumably no more than 5% of the compacted powder was transformed into the new phase with a β -W(A-15) type structure, which is more dense than the original Ti₃P type of structure. The new phase formed by dynamic compaction shows good stability, as shown by the practically unchanged superconducting transition pattern after one hour anneal at 650 C. [Pan, V. M., V. P. Alekseyevskiy, A. G. Popov, Yu. I. Beletskiy, L. M. Yupko, and V. V. Yarosh. A new high-temperature Nb₃Si superconductor. ZhETF P, v. 21, no. 8, 1975, 494-496].

Densification and Metallization of Condensed Matter by Shock Waves (abstract)

The theoretical possibility is shown of converting a solid or liquid into a denser, e. g., metallic, phase by isentropic dynamic compression. In principle, a nearly isentropic compression could be achieved by applying a sequence of weak shock waves with small pressure increments to a condensed mass pre-cooled to a low initial temperature, in the range of 4K. Several possible methods for practical realization of such compression are indicated.

One realistic possibility is the selection of a solid composition with variable specific volume and sonic propagation velocity. Other possibilities include the use of an explosive charge composed of several layers of different lengths, selected to achieve a monotonically increasing detonation pressure on a specimen, or a system of plates propelled by plane shock waves to produce a stepwise increase in pressure on the specimen. A combined static and dynamic compression may be a potentially efficient method for quasi-isentropic compression of liquid hydrogen in the megabar range. [Yampol'skiy, P. A. Isentropic compression using shock waves. VAN, no. 4, 1975, 42-49].

New Boron Nitride Crystalline Form (abstract)

A new boron nitride crystalline form, with density between those of the graphitoid and diamond-like forms, has been discovered in graphitoid specimens subjected to high-pressure pulses. The new phase has a cubic lattice with $a = 5.65 \text{ \AA}$ and $z = 24$. [Kurdyumov, A. V., and A. N. Pilyankevich. Fine crystal structure and phase transitions in boron nitride. IN: Sb. Bor. Polucheniye, struktura i svoystva. Moskva, Nauka, 1974, 181-182. (RZhKh, 19AB, 10/75, #10B417)].

Soluble Heat-Resistant Aromatic Polyimides (abstract)

Aromatic polyimides soluble in polar organic solvents have been synthesized by single- or two-step polycondensation of aromatic diamines, derivatives of 4,4'-diamino-2,2'-diphenylmethane (type I), with tetracarboxylic dianhydrides. The polyimides based on type I derivatives with Ph and Me-substituted CH_2 radical are the most soluble, whereas those based on type I derivatives with four symmetric Ph radicals exhibit the highest heat resistance, beginning to lose weight at 365-390 C in air. Films made from solutions of one of the polyimide series lost $\sim 12\%$ in weight after 7 hours at 450°C and still exhibited its original tensile strength of 300 kg/cm². The end-temperature of thermal oxidation of the newly synthesized polyimides, typically 620 to 740 C, is 80 to 100 C higher than that of the PM or DFO polyimides previously synthesized by the authors. [Glyukhov, N. A., M. M. Koton, Yu. N. Sazanov, and L. M. Shcherbakova. Aromatic polyimides based on 4,4'-diamino-2,2'-diphenylmethane derivatives. Vysokomolek. soyed. Krat. soob, no. 4, 1975, 330-332].

Alloyed Pyrographite (abstract)

An experimental study lists characteristics of B- and Si-alloyed pyrographite deposition by pyrolysis of methane and BCl_3 or SiCl_4 vapor mixtures. The effect of alloying on physicomechanical characteristics of pyrographite is examined. It is concluded that the high-temperature deposition rate of alloyed pyrographite is much greater than that of the nonalloyed type. This rate as a function of chloride concentration and temperature dependences shows maxima. The maximum rate is found in the region of diffusion kinetics, typically 1900-2000 C. The alloying

element content in pyrographite can be varied within a wide range by controlling temperature or, within a narrower range, by controlling chloride concentration. Pyrographites alloyed with 0.5 to 0.8% B or 0.1 to 0.2% Si exhibit maximum microhardness (75 to 90 kg/mm²) and tensile strength (28 to 50 kg/mm²) at a 2500 C deposition temperature. [Yemyashev, A. V. Alloyed pyrographite. Tsvetnyye metally, no. 3, 1975, 46-48].

High-Strength and Heat-Resistant Chromium Alloy (abstract)

A chromium-base alloy with, by weight, 0.5 to 5% Ti; 0.1 to 0.5% N; 0.05 to 0.25% Zr; and 1 to 10% of at least one element of the Mo and V subgroups, is introduced. Tensile strength of the alloy is 52 kg/cm², its time to failure at 1100° is 218 and 109 hrs. at 5 and 7 kg/mm² load, respectively. The alloy is designed for parts operating at 1100 to 1300°, e.g., for nozzle guide vanes of aircraft motors. [Karsanov, G. V., T. P. Khazanova, V. S. Zolotarevskiy, A. G. Fridman, S. V. Indenbaum, T. V. Kalmykova, and V. P. Seleznev. Chromium base alloy. Authors Certificate No. 417516, published 6 Aug 1974. (RZhMetal, 15I, 3/75, no. 3I939P)].

Heat and Thermal Oxidation Resistant Poly(organosilazoxanes) (abstract)

TGA and DTA data are reported for selected poly(organosilazoxanylenes) (identified as type I) and branched chain or cycloliner poly(organosilazoxanes). The rubber-like or solid polymers, soluble in common organic solvents, were prepared by polycondensation of organocyclosilazoxanes with aromatic diols and similar reactions. Weight losses of 20 to 50% in type I polymers were recorded at 300 - 450 C in He and at 300 - 500 C in air. With Ph groups at Si atoms, degradation onset of type I begins at 50 to 60 C higher temperatures. Also, the temperature range of type I degradation increases from 10 to 50% by introducing an NH group into the polymer chain. Chain depolymerization with approximately 10% weight loss in air occurs within 240-420° C and 290-410° C ranges in the branched chain and cycloliner polymers, respectively. Chain depolymerization is concluded to be inhibited by branching of siloxazane molecules. [Andrianov, K. A., A. I. Nogadeyli, S. A. Pavlova, I. V. Zhuravleva, N. G. Lekishvili, Yu. I. Tolchinskiy, and G. V. Ketrelev. Thermal and thermal oxidation destruction of poly(organosilazoxanes). Soobshch. ANGrSSR. v. 78, no. 1, 1975, 97-100].

Ocean Optics Research Method (translation)

Vertical distribution of hydrooptical characteristics were investigated during the 5th cruise of the R/V Dmitriy Mendeleev, using various cable-lowered instruments: the FPR transparency meter, MPN-70 turbidimeter, Poseydon scattering detector and the IPF-70 fluorimeter. A bathythermograph was attached to the FPR to obtain temperature distribution and actual depth of the lower horizon. For comparing optical characteristics with results from the determination of soluble and suspended substances in sea water, samples were tested simultaneously against sea water taken with a 100-130 liter plexiglass water sampler. Seven and 15 liter water samplers were used for determining the results more accurately. Absence of scattering effects and errors in wavelength measurements were verified. Overall accuracy of measuring absorption coefficient κ , exceeding that of distilled water, equalled $>40\%$ at $\kappa < 0.01 \text{ M}^{-1}$, 5% at $\kappa \approx 0.1 \text{ M}^{-1}$, and 3-4% for higher values. Laboratory investigation of scattering characteristics was conducted on an NML turbidimeter, which permits determination of absolute values of scattering coefficient in a given direction in the $3^\circ - 167^\circ$ range in 5 regions of the visible spectrum, using different color filters. Measurements of scattering at small angles were made by the Strela laboratory unit with an accuracy of $\pm 10\%$, and by the Poseydon *in situ* unit. [Kopelevich, O. V., Yu. L. Mashtakov, and S. Yu. Rusanov. Equipment and procedures for investigating optical properties of sea water. IN: Sb. Gidrofiz. i gidrooptich. issled. v Atlant. i Tikhom okeanakh. Moskva, Nauka, 1974, 97-107. (RZhGeofiz, 12/74, #12V36)].

Optical Characteristics of a Point Source in the Ocean (verbatim)

Based on the characteristics of light fields from the Sun and from an immersed isotropic point source in the Atlantic Ocean, Pacific Ocean, and the Black Sea, the absorption coefficient κ , extinction index ϵ , parameters of quantum survival Λ and mean angle of single scattering $\bar{\gamma}$ have been calculated for an active layer, using previously derived relationships. The values of optical characteristics obtained are in good agreement with those estimated by other methods and found in published data. Optical characteristics of the investigated water lie along a common curve in $(\Lambda, \epsilon, \bar{\gamma})$ space, which can be used as a physical basis for the classification of ocean waters. [Pelevin, V. N., and T. M. Prokudina. Determining absorption coefficients and parameters of photon survival from characteristics of a stationary light field in the ocean. Sb. Gidrofiz. i gidrooptich. issled. v Atlant. i Tikhom okeanakh. Moskva, Nauka, 1974, 158-164. (RZhGeofiz, 12/74, #12V142)].

Ocean Water Transparency (verbatim)

Measurements of extinction were conducted during the 5th cruise of the R/V Dmitriy Mendeleev in the tropical Atlantic and Pacific Oceans, using an SGN laboratory spectrohydronephelometer, an FPR submersible transparency meter, as well as a Secchi disc and Forel-Ule scale. The maximum value of sea water transparency (67 m) for the world ocean, based on Secchi disc measurements, was found west of the Cook Islands. High physical transparency down to significant depths, with slight turbidity in the thermocline at 50 m, was also noted in this region. Measurements

of water transparency at depths of 10,000 m in the Tonga Trench showed $\epsilon = 0.11-0.22 \text{ m}^{-1}$ at $\lambda = 473-648 \text{ nm}$, which corresponds to the values of transparency in the open part of the Black Sea.

During the cruise, the lowest transparency was noted in the Gulf of Panama ($\epsilon = 0.23-0.29 \text{ m}^{-1}$). High transparency values, although less than those found in the literature, were observed in the Sargasso Sea. A complex vertical transparency structure with two water layers of increased turbidity (near the upper boundary of thermocline at 70 m and at the center of thermocline at 145 m) was found in the western part of the Gulfstream. [Pavlov, V. M. Transparency of ocean water. Sb. Gidrofiz. i gidrooptich. issled. v Atlant. i Tikhom okeanakh. Moskva, Nauka, 1974, 127-139. (RZhGeofiz, 12/74 #12V139)].

Magnetic Effect on Light Propagation in Water (verbatim)

Extinction spectra were recorded for optical propagation in industrial grade and distilled water subjected to a magnetic field of up to 1500 oe. Optical density was measured at wavelengths from 220 to 1100 nm, at 30 nm intervals. It is shown that with increase in field strength, optical extinction varies in an oscillatory manner, although differently for the two types of water tested. Maximum change was observed at a field of 1200 oe. [Mikhel'son, M. L., E. M. Belyayev, and N. I. Kirnosova. Study of optical extinction spectra in water exposed to a magnetic field. IN: Sb. Voda i magnit. polye. Teoriya, metody indikatsii, primeneniye v teploenerg. Ryazan', 1974, 78-83. (RZhKh, 19AB, 10/75, #10B726)].

Discharger for Mega-Ampere Switching (abstract)

Two variants of a heavy-current vacuum pulse discharger working off a capacity bank are described and compared. Both coaxial and plane-parallel electrode types were tested for longevity, waveform repeatability and breakdown strength. Pulsed currents up to 1200 ka at 50 microseconds were repeatedly switched as many as 2,000 times while switching lag, pulse shape and other characteristics were observed. On balance the coax type appears superior over the long term, although both designs show good repeatability. This finding suggests that switches of this type could be ganged to provide extremely high current commutation. [Dashuk, P. N., and G. S. Kichayeva. Controlled 50 kv vacuum discharger for multiple commutation of mega-ampere currents. PTE, no. 2, 1975, 113-115].

Sawtooth E-Beam Pulse Generator (abstract)

Usually in heavy-current e-beam pulse generators the object is to obtain the shortest possible rise time, with a slower decay. A design furnishing the reverse conditions, with a slow rise and sharp drop, is proposed for certain applications. Basically the rise time is controlled by proper selection of both cathode emitting area and anode-

cathode spacing. Test results of a prototype generator with a sawtooth pulse in the kiloampere range are given. Cathode designs used included a needle cluster and an etched hemisphere. [Zakutin, V. V., N. N. Nasonov, and A. M. Shenderovich. Obtaining a sawtooth current pulse for a heavy-current electron gun. PTE, no. 2, 1975, 25-27].

The ELING Electron Gun (abstract)

A new portable heavy-current electron generator has been developed which discharges to the atmosphere. The generator, named ELING, is based on the earlier developed KVANT generator designed to produce nanosecond x-ray pulses. Details of the high voltage supply, pulse forming circuitry and field emission diode are given, together with a schematic. Maximum pulsed current generated in the output tube has been measured at 10^3 a; exit current through the beryllium foil output window was then at least 200 a with 1.8 nsec duration. The unit operates off of a 220 v source, and weighs 2.4 kg. [Belkin, N. V., V. V. Bogolyubov, V. I. Kolesov, and L. N. Khudyakova. Generator of nanosecond fast electron pulses. PTE, no. 2, 1975, 19-21].

Generation of "Superjets" (verbatim)

Techniques are analyzed for obtaining pulsed liquid jets of high and superhigh pressure, or so-called superjets. Generation of jets by cumulative and hydrocumulative effects, water cannons, and water drills is treated, and a comparative evaluation is made of the various techniques. It is shown that it is possible to generate a jet with a dynamic pressure far exceeding the static pressure in the device. Calculated results are included. [Atanov, G. A. Methods for obtaining superjets. Donetsk Un-tex, 1974, 14 p. (RZhMekh, 4/75, no. 4B696 DEP)].

Plasma Diagnostics Device (abstract)

A remote-control optical system composed of transparent lightguide sections has been developed specifically for evaluation of plasma processes on the forward surfaces of aircraft or spacecraft test models. The light-guide sections are of fused leucosapphire and quartz-sapphire optical fibers. The system has been used successfully in conjunction with a low-temperature plasma generator, and is highly resistant to gamma- and fast neutron radiation. Electron concentrations in the (4.7×10^{12}) to 6.1×10^{12} cm^{-3} range have been measured in a low temperature plasma in contact with the sensing surface of the measuring system. [Kas'yanov, G. V., F. G. Volkov, and M. I. Rudenko. Optical system of plasma processes diagnostics. TVT, no. 2, 1975, 461].

Criticism of Computer Use (abstract)

A report from the Institute for Earthquake-Proof Materials in the Turkmen SSR is critical of the computer usage there. A computer department was established in the Institute in 1969, equipped with a Nairi-2

computer to assist in development of new materials for seismically stable structures. The problem is that owing to a continuing communications gap between researchers and programmers, the computer is underused and in fact is not justifying its annual cost. The author faults the material scientists for this, claiming that it is more logical for them to master programming techniques than for programmers to learn materials theory. He views this as the only way to derive full cost effectiveness from the Nairi-2, despite the fact of its admitted obsolescence. [K. Meredov. A staffing problem with the Nairi-2. Turkmenskaya iskra, 24 July 1975, p. 2].

Acoustic "Laser" (abstract)

The invention is reported of an acoustic gun able to transmit directional signals over a long distance to a target without making a disturbing noise in the surrounding environment. According to G. Zal'tsman, one of the inventors, sound from the gun propagates like a light beam in air. Forty such signal devices are now in operation in the Leningrad railway yards. Their future use is foreseen for traffic control within factories, at construction sites, on river boats and on highways. Noise from the gun is limited to the vicinity of a target, for example a traffic violator. [Chetkarev, V. Acoustic "laser". Sov. Rossiya, no. 201, 29 Aug 75, p. 4].

Mission of the Polish Military Academy of Technology (abstract)

In a review of the Polish Military Academy of Technology, founded in the 1940's, current research objectives and trends are discussed. Following are selected excerpts describing the Academy's role in the national economy.

"The principal task of the Academy in the field of research is to carry out work connected with the development of military techniques, improvement of the design of military equipment, technology of its production, as well as principles and systems of peace-time and war-time applications of this equipment.

However, we take care that everything we do for our armed forces should be - if possible - useful for the civilian economy. Thus the latter profits, in various forms, by the majority of effects of our research. In purely military work we concentrate on the problems of electronics, automation, cybernetics, methods of management, computer science, selected fields of physics, chemistry, mechanics, design, technology and operation. We work on radiolocation, anti-interference, communication and command automation systems, on armament, military engineering and geodesy, military vehicles, aviation technique, engineering equipment etc. This work concerns advance and preliminary research, elaborating design assumptions and specifications, building of prototypes, participation in and supervising of the starting of production, principles of practical application of appliances and entire systems. Much of this work may be and actually is being made use of by the national economy. . .

"Tasks performed for the Forces and the economy are often coupled; for example, a new branch of electronics created at the Academy, that is electronphononics, found its application in military radiolocation stations. Simultaneously, similar systems will be mass-produced for the national economy (for example, for colour TV, which may radically change its technology).

Another example may be technical cybernetics. In this field entire large systems are being constructed for the Forces and at the same time a number of computers, for example, analogue or hybrid, combining the characteristics of the former with those of digital computers - for the national economy. Several hybrid computers of our make are already working in the industry.

A large set of problems and projects carried out at the Academy for the national economy concerns quantum electronics. Our lasers, in addition to military applications, are practically applied in medicine, for example the coagulator for joining eye retina and laser-type surgeon's lancet; in mining - to determine the axes of galleries and shafts; in industry, the micro-impact grinder for making holes in hard materials, devices for studying the structure of materials and for length measurement, etc. We also conduct physical studies on heating up of plasma with the use of lasers, this being one of the modern research trends in the world. Its aim is to find future sources of energy. For the mining industry we also work out methods of discovering crumps, underground radio communications, methods of shaft driving, shooting equipment (exploders, misfire detectors) etc.

Methods worked out at the Academy for calculating fortifications have been applied in the building industry, as well as new materials such as plastoconcretes, polyester marbles, stabilized soils etc. . . ."

This review is principally authored by Sylvester Kaliski, Commanding General of the Academy and the leading high-power laser theoretician in Poland, particularly in laser fusion research. [Kaliski, S. and W. Kujawski. Yesterday, today and tomorrow of the Military Academy of Technology. Review of the Polish Academy of Sciences, v. 20, no. 1, 1975, 62-65].

Suspension of Fusion Microballoons (abstract)

In laser fusion experiments using microballoon targets, problems arise as to the best way of supporting the microballoons, which are on the order of 100 microns diameter. Suspension from various types of sufficiently fine threads, including metallic, quartz and deuterated polyethylene, has been attempted but has encountered difficulties with mechanical properties, heat conductivity or dielectric constant.

An improved technique has been tried at FIAN using filaments of rubber cement. These are pulled slowly from a 30% solution of rubber cement in benzine, using a steel needle, to obtain uniform threads from 0.5 to 10 microns in diameter. An example given shows 60-micron spheres suspended from 3.5 micron threads. Tests have shown the rubber cement to have superior mechanical, thermal and electrical properties, even at cryogenic temperatures; suspension of a solid hydrogen sphere in this fashion is referred to. [Rychkova, Ye. R. Subminiature suspension of specimens. Kvantovaya elektronika, no. 5, 1975, 1048-1049].

"Seeing" IR Laser Radiation (abstract)

Data has been earlier published on visual sensing of pulsed radiation in the 1.11-1.18 micron range, in which pulses are perceived as flashes in the yellow-green to orange range. More detailed tests have been recently done to try to identify the nature of the IR stimulus on the naked eye. Observing low level radiation from a neodymium glass laser, a subject attempted to match the perceived flash color with that from a monochromator. Both pulsed and free-running laser modes were used. The response of a frog's eye was also monitored in the form of its retinal impulse. Data were obtained as functions of laser intensity, beam divergence, and dark adaptation of the subject.

The results suggest that the observed effects bear a photo-receptor character and are perhaps connected with nonlinear optical effects taking place in the retinal structure. The authors propose two different processes which might be responsible for the above observed phenomena: 1) Two-photon absorption, and 2) Generation of second harmonics, with perception immediately following. The latter seems supported by the human response, in which the sensed flash color was at approximately half the wavelength of the transmitted laser signal. [Savin, B. M., R. I. Kovach, and Ye. Ye. Kolchin. Role of nonlinear optical effects in the process of photoreception of laser radiation. DAN SSSR, v. 221, no. 1, 1975, 255-256].

Determining Density State on a Semiconductor Surface (abstract)

A charge-coupling technique is proposed which provides sensitive measurements of surface charge density N_s in a semiconductor. While present Si-SiO₂ structures, for example, can have low N_s , methods for measuring it are restricted to values on the order of 10^9 - 10^{10} and above, owing to the obscuring effect of charge in the bulk semiconductor.

The proposed method is based on cumulative charge transfer through a series of closely-spaced surface electrodes. It is shown theoretically that the method should allow measurement down to $10^4/\text{cm}^2$ at room temperature, and several orders of magnitude lower at liquid nitrogen temperature. Test data on a four-electrode Si structure with $N_s = 10^{10}/\text{cm}^2$ are briefly mentioned, in which electrode spacing of 1 to 2 microns was used. Criticality of electrode spacing and recombination time is emphasized. [Pospelov, V. V., R. A. Suris, Ye. A. Fetisov, B. I. Fuks, and R. Z. Khafizov. A new method for determining surface density state in a semiconductor. ZhETF P, v. 21, no. 7, 1975, 448-451].

R-F Heating of the Ionosphere (abstract)

A series of experiments on local r-f excitation of the ionosphere were done at Gorkiy in 1973-74. A detailed description of the methods and an analysis of the results are given. Excitation effects in the F-layer were observed both from pulsed probe signals during the r-f heating interval, as well as by observing change in r-f reception from the Cassiopeia-A radio source as its trajectory passed through the excited region.

Excitation was at 5.75 MHz, using an antenna with vertical gain of 150 and a transmitter power of 130 kw. Auxiliary probes and receivers were located at the transmitter site as well as 100 km east of Gorkiy. The excitation region was chosen so as to be bisected by the trajectory of Cassiopeia-A, all measurements being made during daylight hours.

The most pronounced variation in reflected signal and Cas-A reception occurred when the excitation signal had ordinary polarization and was below the critical frequency of the F-layer. Observed scintillation data are analyzed in terms of r-f parameters and excitation relaxation intervals following transmission. Some possible models for the observed effects are suggested. [Belikovich, V. V., Ye. A. Benediktov et al. New results in studies of nonlinear phenomena in the ionosphere. IVUZ Radiofiz, no. 4, 1975, 516-526].

R-F Beam Effects on the Ionosphere (abstract)

An analysis is given of ionospheric reflection of powerful r-f radiation in the 20-120 kHz range. The nonlinearity of the propagation medium is treated in terms of plasma parameters as a function of electron temperature. Calculations are given on coefficient of r-f reflection as a function of transmitter power and frequency. Results are found for the case of both quasi-axial and quasi-transverse propagation. Having found the relationship of power and frequency to reflection coefficient, one may deduce the relation of effective collision frequency to electron temperature.

In a comparison article on the same topic, the author considers the r-f effect on electron density N_e and temperature of the lower ionosphere, for the case in which increased diffusion of the plasma owing to electron heating becomes appreciable. It is shown that with sufficiently powerful r-f excitation the diffusion process is accompanied by a rise in N_e in the lower portion of the layer. At the same time, a powerful extraordinarily-polarized wave at gyroresonance will cause a drop in N_e . The correlation of these effects to transmitter frequency and power are calculated. Computer-generated profiles of N_e are included. [Plotkin, V. V. On reflection from the ionosphere of powerful LF radiowaves. IN: Sb. Voprosy issled. nizhn. ionosfery i geomagnetizm. Novosibirsk, 1974, 46-56 (RZhGeofiz, 5/75, no. 5A270). Ibid., On the role of the transport process during powerful r-f effects on the lower ionosphere, op. cit., 5-15. (RZhGeofiz, 5/75, no. 5A78)].

Recent Publications

Abrikosov, N. Kh., and L. Ye. Shelimova. Poluprovodnikovyye materialy na osnove soyedineniy A⁴ V⁶ (Semiconductor materials based on A⁴ V⁶ compounds). Moskva, Izd-vo Nauka, 1975, 194 p. (LC-VKP)

Alyuminiyevyye i magniyevyye splavy, armirovannyye voloknami (Fiber-reinforced aluminum and magnesium alloys). Moskva, Izd-vo Nauka, 1974, 199 p. (LC-VKP)

Baranskiy, P. I., V. P. Klochkov, and I. V. Potykevich. Poluprovodnikovaya elektronika: svoystva materialov. Spravochnik. (Semiconductor electronics: properties of materials, Handbook). Kiyev, Izd-vo Naukova dumka, 1975, 703 p. (LC-VKP)

Borisov, V. V. Pentagon i nauka (The Pentagon and science). Izd-vo Voenizdat, 1975, 190 p. (LC-VKP)

Bugreyev, A. N. Nezrimoye oruzhiye (Invisible weapons). Volgograd. Nizh. -volzh. kn. Izd-vo, 1974, 158 p. (LC-VKP)

Drozhzhinov, V. I. et al. Arkhitektura seti vychislitel'nykh tsentrov arpanet (obzor) (Structure of the Arpanet network of computer centers. Survey). (RBL, 5-6/75, no. 20)

Elektrodinamika plazmy (Electrodynamics of plasma). Moskva, Izd-vo Nauka, 1974, 719 p. (LC-VKP)

Fizika i primeneniye plazmennyykh uskoriteley: Materialy konf. 2-5 okt. 1973 g. (Physics and application of plasma accelerators: Material from the Conference of October 2-5, 1973). Minsk, Izd-vo Nauka i tekhnika, 1974, 399 p. (LC-VKP)

Florov, A. K. Avtomatizatsiya obrabotki informatsii pri vysokochastotnykh izmereniyakh (Automation of information processing for high-frequency measurements). Kiyev, Izd-vo Tekhnika, 1975, 142 p. (LC-VKP)

Galushkin, A. I. Sintez mnogosloynnykh sistem raspoznavaniya obrazov (Synthesis of multilayered pattern recognition systems). Moskva, Izd-vo Energiya, 1974, 366 p. (LC-VKP)

Grigoryan, L. A. Zapominayushchiye ustroystva na tsilindricheskikh magnitnykh plenkakh (Cylindrical magnetic film memories). Moskva, Izd-vo Energiya, 1975, 141 p. (LC-VKP)

Issledovaniya po fizike poluprovodnikov. Sbornik statey. (Studies on semiconductor physics). Baku, Elm, 1974, 131 p. (LC-VKP)

Issledovaniya v oblasti sinteza polimernyykh i monomernyykh produktov. (Studies in synthesis of polymer and monomer products). Baku, Elm, 1974, 206 p. (KL, 24/75, no. 21151)

Ivanov, Yu. L. Primeneniye lazerov v nauchnykh issledovaniyakh (Using lasers in scientific studies). Leningrad, Izd-vo Znaniye, 1975, 36 p. (LC-VKP)

Kan, K. N. Voprosy teorii teplovogo rasshireniya polimerov (Theoretical problems on the thermal expansion of polymers). Leningrad, Izd-vo Leningrad, un-ta, 1975, 78 p. (LC-VKP)

Kholosha, B. M. NATO i atom: Yadernaya politika severoatlanticheskogo bloka (NATO and the atom: Nuclear politics of the North Atlantic bloc). Moskva, Izd-vo Znaniye, 1975, 126 p. (LC-VKP)

Komar, Ye. G. Osnovy uskoritel'noy tekhniki (Principles of accelerator technology). Moskva, Izd-vo Atomizdat, 1975, 367 p. (LC-VKP)

Kompleksnyye issledovaniya Karibskogo morya, Meksikanskogo zaliva i sopredel'nykh vod. Sbornik statey. (Complex investigations of the Caribbean Sea, Gulf of Mexico and adjacent waters. Collection of articles). Moskva, Izd-vo Nauka, 1975, 360 p. (LC-VKP)

Lebedev, V. L. et al. Okean kak dinamicheskaya sistem (The ocean as a dynamic system). Leningrad, Gidrometeoizdat, 1974, 205 p. RBL, 5-6/75, no. 574)

Levastu, T., et al. Promyslovaya okeanografiya (Commercial oceanography). Leningrad, Gimiz., 1974, 295 p. (RBL, 5-6/75, no. 575)

Lobkova, L. M. Statisticheskaya teoriya antenn sverkhvysokikh i opticheskikh chastot: Vliyaniye atmosferyoy turbulentnosti na kharakteristiki antenn (Statistical theory of SHF and optical frequency antennas: Effect of atmospheric turbulence on antenna characteristics). Moskva, Izd-vo Svyaz', 1975, 173 p. (LC-VKP)

Magden, I. N., and Yu. G. Sukharev. Novyye poluprovodnikovyye pribory (New semiconductor devices). Moskva, Izd-vo Znaniye, 1975, 63 p. (LC-VKP)

Mekhanika polimerov i sistem (Mechanics of polymers and systems). Sverdlovsk, UNTs, 1974, 110 p. (LC-VKP)

Nauchnyye i prikladnyye problemy energetiki: resp. mezhved. sbornik. (Scientific and applied problems in power engineering. Collection of articles). Minsk, Vysheysh. shkola, 1974. (LC-VKP)

Nelidov, I. Ye., and L. G. Nikonova. Perspektivnoye planirovaniye proizvodstva s primeneniyyem EVM (Long-term planning for computer-aided production). Moskva, Ekonomika, 1975, 173 p. (LC-VKP)

Nelineynyye i lineynyye metody v raspoznavanii obrazov (Nonlinear and linear methods of pattern recognition). Moskva, Izd-vo Nauka, 1975, 156 p. (LC-VKP)

Prikladnaya spektroskopiya: Sbornik obzornykh dokl. 17-go Vsesoyuz. S'yezda po spektroskopii, Minsk, 5-9 iyulya 1971 g. (Applied spectroscopy. Collection of review articles, presented at the 17th All-Union Conference on Spectroscopy, Minsk, July 5-9, 1971). Minsk, 1974, 303 p. (LC-VKP)

Radiopere dayushchiye i radiopriyemnyye ustroystva (Sbornik statey) [Radio transmitting and receiving devices]. Moskva, 1974, 173 p. (LC-VKP)

Romanenko, Ye. V. Fizicheskiye osnovy bioakustiki (Physical basis of bioacoustics). Moskva, Nauka, 1974, 178 p. (UFN, v. 116, no. 1, 1975, 182)

Rozenberg, B. A., V. I. Irzhak, and N. S. Yenikolopyan. Mezhtsepnoy obmen v polimerakh (Interbond exchanges in polymers). Moskva, Khimiya, 1975, 236 p. (LC-VKP)

Sal'man, L. A. Sovremennyye vychislitel'nyye sistemy (Modern computing systems). Moskva, Izd-vo Znaniye, 1975, 62 p. (LC-VKP)

Sintez i issledovaniye polimerov (Synthesis and studies of polymers). Alma-Ata, Izd-vo Nauka, 1975, 118 p. (LC-VKP)

Svoystva nekotorykh novykh poluprovodnikovyykh materialov i priborov. (Sbornik statey). (Properties of some new semiconductor materials and devices. Collection of articles). Kishinev, Izd-vo Shtiintsa, 1974, 81 p. (LC-VKP)

TePLYakov, I. M., I. D. Kalashnikov, and B. V. Roshchin. Radiolinii kosmicheskikh sistem peredachi informatsii (Radio links for cosmic data transmission systems). Moskva, Sov. radio, 1975, 398 p. (LC-VKP)

Tochnost' i nadezhnost' elektronnykh sistem obrabotki informatsii (Accuracy and reliability of electronic information processing systems). Kiyev, Izd-vo Naukova dumka, 1975, 129 p. (LC-VKP)

Voprosy kibernetiki: Problemy aviatsionnoy i kosmicheskoy kibernetiki; adaptivnyye sistemy upravleniya letat. apparatov s TsVM. (Sbornik Statey) (Problems in cybernetics: Problems of aviation and cosmic cybernetics; adaptive systems for controlling aircraft with a central computer). Moskva, AN SSSR, Nauch. sovet po kompleksnoy probleme "Kibernetika", 1974, 173 p. (LC-VKP)

Voprosy okeanografii dal'nevostochnykh morey i severnoy chasti Tikhogo okeana. Sbornik statey (Oceanographic problems of Far Eastern seas and the Northern Pacific Ocean. Collection of articles). Leningrad, Izd-vo Gidrometeoizdat, 1975, 135 p. (LC-VKP)

Vysokotemperaturnyye karbidy (High-temperature carbides). Kiyev, Izd-vo Naukova dumka, 1975, 191 p. (LC-VKP)

Zhuravlev, G. I. Khimiya i tekhnologiya termostoykikh neorganicheskikh pokrytiy (Chemistry and technology of heat-resistant inorganic coatings). Leningrad, Khimiya, Leningr. otd-niye, 1975, 198 p. (LC-VKP)

SOURCE IDENTIFICATION

DAN SSSR	-	Akademiya nauk SSSR. Doklady
IVUZ Radiofiz	-	Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika.
KL	-	Knizhnaya letopis'
LC-VKP	-	Library of Congress acquisition
PTE	-	Pribory i tekhnika eksperimenta
RBL	-	Russian Book List
RZhGeofiz	-	Referativnyy zhurnal. Geofizika
RZhKh	-	Referativnyy zhurnal. Khimiya
RZhMetal	-	Referativnyy zhurnal. Metallurgiya
TVT	-	Teplofizika vysokikh temperatur
YAN	-	Akademiya nauk SSSR. Vestnik
ZhETF P	-	Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu.